THE ASSOCIATION BETWEEN COMPENSATION AND OUTCOME AFTER INJURY.

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DECLARATION

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which to a substantial extent has been accepted for the award of any other degree or diploma of the university or other institute of higher learning.

This research was developed by the author, with guidance from the two supervisors. Assistance with data collection and statistical analysis, and specific advice, where provided, is outlined in the acknowledgements. All other work, including all writing, was performed by the author alone.

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ABSTRACT

Work-related injuries and road traffic injuries are common causes of morbidity and are major contributors to the burden of disease worldwide. In developed countries, these injuries are often covered under compensation schemes, and the costs of administering these schemes is high. The compensation systems have been put in place to improve the health outcomes, both physical and mental, of those injured under such systems; yet there is a widespread belief, and some evidence, that patients treated under these schemes may have worse outcomes than if they were treated outside the compensation system.

Chapter One of this thesis explores the literature pertaining to any effect that compensation may have on patient outcomes. It is noted that the concept of "compensation neurosis" dates from the nineteenth century, with such injuries as "railway spine", in which passengers involved in even minor train accidents at the time, would often have chronic and widespread symptoms, usually with little physical pathology. Other illnesses have been similarly labelled over time, and similarities are also seen in currently diagnosed conditions such as repetition strain injury, back pain and whiplash. There are also similarities in a condition that has been labelled "shell shock", "battle fatigue", and "post-traumatic stress disorder"; the latter diagnosis originating in veterans of the Vietnam War.

While there is evidence of compensation status contributing to the diagnosis of some of these conditions, and to poor outcomes in patients diagnosed with

these conditions, there is little understanding of the mechanism of this association. In contrast to popular stereotypes, the literature review shows that malingering does not contribute significantly to the effect of compensation on health outcomes. Secondary gain is likely to play an important role, but secondary gain is not simply confined to financial gain, it also includes gains made from avoidance of workplace stress and home and family duties.

Other psychosocial factors, such as who is blamed for an injury (which may lead to retribution as a secondary gain) or the injured person's educational and occupational status, may also influence this compensation effect.

The literature review concludes that while the association between compensation and health after injury has been widely reported, the effect is inconsistent. These inconsistencies are due, at least in part, to differences in definitions of compensation (for example, claiming compensation versus using a lawyer), the use of different and poorly defined diagnoses (for example, back pain), a lack of control groups (many studies did not include uncompensated patients), and the lack of accounting for the many possible confounding factors (such as measures of injury severity or disease severity, and socio-economic and psychological factors). The literature review also highlighted the variety of different outcomes that had been used in previous studies, and the paucity of literature regarding the effect of compensation on general health outcomes.

This thesis aims to explore the association between compensation status and health outcome after injury. It addresses many of the methodological issues of the previously published literature by,

i selecting study populations of patients with measurable injuries,

ii clearly defining and separating aspects of compensation status,

iii including control groups of non-compensated patients with similar injuries

iv allowing for a wide variety of possible confounders, and

v using clearly defined outcome measures, concentrating on general health outcomes.

Before commencing the clinical studies reported in Chapters Three and Four, a systematic review and meta-analysis was performed to quantify and analyse the effect of compensation on outcome after surgery. This allowed a clearly defined population of studies to be included, and was relevant to the thesis as the surgeries were performed as treatment of patients who had sustained injuries. The study, which is reported in Chapter Two, hypothesised that outcomes after surgery would be significantly worse for patients treated under compensation schemes.

The study used the following data sources: Medline (1966 to 2003), Embase (1980 to 2003), CINAHL, Cochrane Controlled Trials Register, reference lists of retrieved articles and textbooks, and contact with experts in the field. The review included any trial of surgical intervention where compensation status was reported and results were compared according to that status, and no

restrictions were placed on study design, language or publication date. Data extracted were study type, study quality, surgical procedure, outcome, country of origin, length and completeness of follow-up, and compensation type. Studies were selected by two unblinded independent reviewers, and data were extracted by two reviewers independently.

Data were analysed using Cochrane Review Manager (version 4.2). Two hundred and eleven papers satisfied the inclusion criteria. Of these, 175 stated that the presence of compensation (worker's compensation with or without litigation) was associated with a worse outcome, 35 found no difference or did not describe a difference, and one paper described a benefit associated with compensation.

A meta-analysis of 129 papers with available data (20,498 patients) revealed the summary odds ratio for an unsatisfactory outcome in compensated patients to be 3.79 (95% confidence interval 3.28 to 4.37, random effects model). Grouping studies by country, procedure, length of follow-up, completeness of follow-up, study type, and type of compensation showed the association to be consistent for all sub-groups.

This study concludes that compensation status is associated with poor outcome after surgery, and that this effect is significant, clinically important and consistent. Therefore, the study hypothesis is accepted. However, as data were obtained from observational studies and were not homogeneous, the summary effect should be interpreted with caution.

Determination of the mechanism for the association between compensation status and poor outcome, shown in the literature review (Chapter One) and the systematic review (Chapter Two) required further study. Two studies were designed to further explore this association and these are reported in Chapters Three and Four.

The retrospective study reported in Chapter Three, the Major Trauma Outcome Study (MTOS), aimed to explore the association between physical, psychosocial, and compensation-related factors and general health after major physical trauma. The primary hypothesis predicted significantly poorer health outcomes in patients involved in pursuing compensation, allowing for possible confounders and interactions. The study also examined other health outcomes that are commonly associated with compensation, and examined patient satisfaction.

Consecutive patients presenting to a regional trauma centre with major trauma (defined as an Injury Severity Score greater than 15) were surveyed between one and six years after their injury. The possible predictive factors measured were: general patient factors (age, gender, the presence of chronic illnesses, and the time since the injury), injury severity factors (injury severity score, admission to intensive care, and presence of a significant head injury), socio-economic factors (education level, household income, and employment status at the time of injury and at follow-up), and claim-related factors (whether a claim was pursued, the type of claim, whether the claim had settled, the time to settlement, the time since settlement, whether a lawyer

was used, and who the patient blamed for the injury). Multiple linear regression was used to develop a model with general health (as measured by the physical and mental component summaries of the SF-36 General Health Survey) as the primary outcome. The secondary outcomes analysed were: neck pain, back pain, post-traumatic stress disorder, and patient satisfaction.

On multivariate analysis, better physical health was significantly associated with increasing time since the injury, and with lower Injury Severity Scores. Regarding psychosocial factors, the education level and household income at the time of injury were not significantly associated with physical health, but pursuit of compensation, having an unsettled claim, and the use of a lawyer were strongly associated with poor physical health.

Measures of injury severity or socio-economic status were not associated with mental health. However, the presence of chronic illnesses and having an unsettled compensation claim were strongly associated with poor mental health.

Regarding the secondary outcomes, increasing neck pain and back pain were both significantly associated with lower education levels and the use of a lawyer, but not significantly associated with claiming compensation. The severity of symptoms related to post-traumatic stress disorder was not associated with measures of injury severity, but was significantly and independently associated with the use of a lawyer, having an unsettled compensation claim, and blaming others (not themselves) for the injury. The

strongest predictor of patients' dissatisfaction with their progress since the injury was having an unsettled compensation claim, and as with the other secondary outcomes, patient satisfaction was not significantly associated with injury severity factors.

Factors relating to the compensation process were among the strongest predictors of poor health after major trauma, and were stronger predictors than measures of injury severity. The hypothesis that general physical and mental health would be poorer in patients involved in seeking compensation for their injury was accepted. This study concludes that the processes involved with claiming compensation after major trauma may contribute to poor health outcomes.

The prospective study reported in Chapter Four, the Motor Vehicle Accident Outcome Study (MVAOS), aimed to explore the effect of compensation related factors on general health in patients suffering major fractures after motor vehicle accidents (MVAs). The study hypothesized that general health would be poorer in patients claiming compensation for their injuries.

Patients presenting to 15 hospitals with one or more major fractures (any long bone fracture, or fracture of the pelvis, patella, calcaneus or talus) after a motor vehicle accident were invited to participate in this prospective study. Initial data was obtained from the patient and the treating doctors. Both the patients and treating surgeons were followed up with a final questionnaire at six months post injury. General factors (age, gender, treating hospital, country

of birth, presence of chronic illnesses and job satisfaction), injury factors (mechanism of injury, number of fractures, and the presence of any non-orthopaedic injuries), socioeconomic factors (education level, income, and employment status), and compensation-related factors (whether a claim was made, the type of claim, whether a lawyer was used, and who was blamed for the injury) were used as explanatory variables. The primary outcome was general health as measured by the physical and mental component summaries of the SF-36 General Health Survey. The secondary outcomes were neck pain, back pain, and patients' ratings of satisfaction with progress and of recovery. Multiple linear regression was used to develop predictive models for each outcome.

Completed questionnaires were received from 232 (77.1%) of the 301 patients included in the study. Poor physical health at six months was strongly associated with increasing age, having more than one fracture, and using a lawyer, but not with pursuit of a compensation claim. Poor mental health was associated with using a lawyer and decreasing household income.

Increasing neck pain and back pain were both associated with the use of a lawyer and with lower education levels. Higher patient satisfaction and patient-rated recovery were both strongly associated with blaming oneself for the injury, and neither were associated with pursuit of compensation.

Although the use of a lawyer was a strong predictor of the primary outcomes, the pursuit of a compensation claim was not remotely associated with these outcomes, and therefore the study hypothesis was rejected.

The studies reported in this thesis are compared in the final chapter, which concludes that poor health outcomes after injury are consistently and strongly associated with aspects of the compensation process, particularly the pursuit of a compensation claim, involvement of a lawyer, and having an unsettled claim. Compensation systems may be harmful to the patients that these systems were designed to benefit. Identification of the harmful features present in compensation systems my allow modification of these systems to improve patient outcomes.

ABBREVIATIONS

AIS	Abbreviated Injury Scale
ABS	Australian Bureau of Statistics
ANOVA	Analysis of variance
CI	Confidence interval
CTP	Compulsory Third Party insurance
DF	Degrees of freedom
DSM	Diagnostic and Statistical Manual of Mental Disorders
HAVS	Hand Arm Vibration Syndrome
ISS	Injury Severity Score
LEAP	Lower Extremity Assessment Project
MMPI	Minnesota Multiphasic Personality Inventory
MRI	Magnetic resonance imaging
MBA	Motor bike accident
MBC	Motor bike crash
MCS	Mental component summary (of the SF-36)
M-H	Mantel-Haenszel
MTOS	Major Trauma Outcome Study
MVA	Motor vehicle accident
MVC	Motor vehicle crash
MVAOS	Motor Vehicle Accident Outcome Study
PCS	Physical component summary (of the SF-36)
PTSD	Post-traumatic stress disorder
RSI	Repetition strain injury

SD	Standard deviation
SF-36	Short-Form 36 General Health Survey
TOS	Thoracic outlet syndrome
WRAP	Work-related arm pain

LIST OF TABLES

Table 2.1	Medline search strategy and results (15 July 2003)	79
Table 2.2	Embase search strategy and results (15 July 2003)	80
Table 2.3	CINAHL search strategy and results (5 Sept 2003)	80
Table 2.4	Sub-group analyses of the association between compensation status and unsatisfactory outcome	94
Table 3.1	A list of all exposure and outcome variables	133
Table 3.2	A comparison of responding and non-responding patients	148
Table 3.3	Frequency and means of explanatory variables	149
Table 3.4	Unadjusted association between explanatory variables and PCS	153
Table 3.5	Adjusted (multivariate) association of explanatory variables for PCS in the final model	155
Table 3.6	The adjusted mean PCS for each group of claim	155
Table 3.7	Unadjusted (univariate) association of explanatory variables for MCS	157
Table 3.8	Adjusted (multivariate) association of explanatory variables for MCS in the final model	158
Table 3.9	The adjusted mean MCS for each group of claim	159
Table 3.10	Unadjusted association of explanatory variables for neck pain	160
Table 3.11	Adjusted (multivariate) association between explanatory variables and neck pain	162
Table 3.12	Multivariate association between explanatory variables and neck pain, including PTSD as an explanatory variable	162
Table 3.13	Unadjusted association of explanatory variables for low back pain	165
Table 3.14	Adjusted (multivariate) association between explanatory variables and back pain	166

Table 3.15	Multivariate association between explanatory variables and back pain, including PTSD as an explanatory variable	166
Table 3.16	Univariate analysis of the association between patient satisfaction and exposure variables	168
Table 3.17	Independent predictors of patient dissatisfaction	169
Table 3.18	Univariate (unadjusted) analysis of explanatory variables for PTSD scale as a continuous outcome	171
Table 3.19	Adjusted (multivariate) association for the explanatory variables and PTSD score as a continuous outcome	173
Table 3.20	The adjusted mean PTSD scores for each category of claim and blame in the final model	173
Table 3.21	The association between type of claim (CLAIMTYPE) and the outcome variables	175
Table 3.22	Summary of previous studies of outcome after major trauma	190
Table 4.1	Mean JSS (job satisfaction survey) scores for each response	231
Table 4.2	The explanatory and outcome variables measured	237
Table 4.3	Characteristics of the participants	245
Table 4.4	A comparison of patients who did or did not respond to the follow-up questionnaire	246
Table 4.5	Comparison of patients for whom a questionnaire was or was not received from their surgeon	246
Table 4.6	Unadjusted association between explanatory variables and PCS	248
Table 4.7	Adjusted (multivariate) associations between explanatory variables and PCS	249
Table 4.8	Unadjusted associations between explanatory variables and MCS	250
Table 4.9	Adjusted (multivariate) associations between explanatory variables and MCS	251

Table 4.10	Unadjusted association between explanatory variables and neck pain as a continuous variable	253
Table 4.11	Adjusted (multivariate) associations between explanatory variables and neck pain score	254
Table 4.12	Adjusted (multivariate) associations between explanatory variables (including fracture union) and neck pain score	254
Table 4.13	The unadjusted associations between the explanatory variables and back pain score	256
Table 4.14	Adjusted (multivariate) associations between explanatory variables and back pain score	257
Table 4.15	Frequency of patient responses regarding satisfaction with progress since the injury	257
Table 4.16	Univariate (unadjusted) associations between explanatory variables and patient satisfaction	259
Table 4.17	Frequency of patient responses regarding general recovery from the injury	260
Table 4.18	Univariate (unadjusted) associations between explanatory variables and patient-rated recovery	261
Table 4.19	Adjusted (multivariate) associations between explanatory variables and patient-rated recovery	262
Table 4.20	Associations between the SF-36 summary scores and patient-rated satisfaction and recovery	262
Table 4.21	Univariate (unadjusted) associations between explanatory variables and surgeon-rated satisfaction	265
Table 4.22	Univariate (unadjusted) associations between explanatory variables and surgeon-rated recovery	266
Table 4.23	Associations between the SF-36 summary scores and surgeon-rated satisfaction and recovery	267
Table 4.24	Unadjusted association between explanatory variables and fracture union (absence of non-union)	269

LIST OF FIGURES

Figure 2.1	Data abstraction form for the systematic review	82
Figure 2.2	Results and forest plot for the results for all studies in the meta-analysis	89
Figure 2.3a	Enlarged forest plot, top half	90
Figure 2.3b	Enlarged forest plot, bottom half	91
Figure 2.4	Forest plot of results according to the study type for randomised controlled trials	95
Figure 2.5	Forest plot of results according to the study type for cohort studies	95
Figure 2.6	Forest plot of results according to the study type for case series	96
Figure 2.7	Forest plot for subgroup analysis of lumbar discectomy	98
Figure 2.8	Forest plot for subgroup analysis of acromioplasty	98
Figure 2.9	Forest plot for subgroup analysis of cervical spine fusion	98
Figure 2.10	Forest plot for subgroup analysis of intradiscal chymopapain	99
Figure 2.11	Forest plot for subgroup analysis of carpal tunnel decompression	99
Figure 2.12	Forest plot for subgroup analysis of lumbar fusion	99
Figure 2.13	Forest plot for subgroup analysis of studies from the USA	100
Figure 2.14	Forest plot for subgroup analysis of studies from Europe	101
Figure 2.15	Forest plot for subgroup analysis of studies from Australia	101
Figure 2.16	Forest plot for subgroup analysis of studies from Canada	101
Figure 2.17	Funnel plot of all studies included in the meta-analysis	104

Figure 3.1 Summary of study participants 146
Figure 4.1 Summary of patient recruitment and follow-up 244

TABLE OF CONTENTS

Declaration i

Acknowledgements ii

Abstract iv

Abbreviations xiii

List of tables xv

List of figures xviii

Chapter One: Introduction and literature review.

1.1 Introduction 1

1.2 Definitions 3

1.3 Professional background 8

1.4 Problem statement 10

1.5 Literature review 13

1.5.1 Historical perspective 13

1.5.2 Specific conditions 21

1.5.2.1 Chronic pain 21

1.5.2.2 Low back pain 24

1.5.2.3 Whiplash 26

1.5.2.4 Work-related arm pain 34

1.5.2.5 Head injury 36

1.5.2.6 Post-traumatic stress disorder 37

1.5.2.7 Other conditions 41

1.5.3 Proposed mechanisms 43

1.5.3.1 Malingering 44

1.5.3.2 Physical factors 54

1.5.3.3 Secondary gain 56

1.5.3.3.1 Financial factors 57

1.5.3.3.2 Psychosocial factors 58

1.5.3.4 Tertiary gain 62

1.5.4 Summary of the literature 68

1.6 Statement of objectives 71
1.6.1 Aim 71
1.6.2 Study hypotheses 72

Chapter Two: The association between compensation and outcome after surgery, a systematic review and meta-analysis.

2.1 Introduction 74
2.1.1 Aims and specific hypotheses 76
2.2 Materials and methods 77
2.3 Results 85
2.3.1 Study retrieval 85
2.3.2 Overall association 87
2.3.3 Sub-group analyses and heterogeneity 93
2.4 Discussion 105
2.5 Conclusion 114

Chapter Three: The association between compensation status and health outcomes after major trauma, a retrospective survey (Major Trauma Outcome Study).

3.1 Introduction 115
3.1.1 Study aims and hypotheses 118
3.2 Materials and methods 120
3.2.1 General methods 120
3.2.2 Study population 121
3.2.3 Medical record data 123
3.2.4 Questionnaire data 124
3.2.5 Mailing of the questionnaire 130
3.2.6 Measures 132
3.2.6.1 Explanatory variables 132
3.2.6.2 Outcome variables 137
3.2.7 Sample size calculation 139
3.2.8 Statistical analysis 140
3.3 Results 145
3.3.1 Patient sample 145

3.3.2 Frequency and distribution of responses 148
3.3.3 Hypothesis 1: Physical health 152
3.3.3.1 Univariate analysis 152
3.3.3.2 Multivariate analysis 154
3.3.4 Hypothesis 2: Mental health 156
3.3.4.1 Univariate analysis 156
3.3.4.2 Multivariate analysis 156
3.3.5 Hypothesis 3: Neck pain 159
3.3.5.1 Univariate analysis 159
3.3.5.2 Multivariate analysis 159
3.3.6 Hypothesis 4: Back pain 163
3.3.6.1 Univariate analysis 163
3.3.6.2 Multivariate analysis 163
3.3.7 Hypothesis 5: Patient satisfaction 167
3.3.7.1 Univariate analysis 167
3.3.7.2 Multivariate analysis 167
3.3.8 Hypothesis 6: Post-traumatic stress disorder 170
3.3.8.1 Univariate analysis 170
3.3.8.2 Multivariate analysis 172
3.3.9 Compensation: claim pursuit versus entitlement 174
3.3.10 Fault-based versus no-fault compensation 174
3.4 Discussion 176
3.4.1 Summary of main results 176
3.4.2 Comments on methods 178
3.4.2.1 General methods 178
3.4.2.2 Outcome variables 181
3.4.2.3 Explanatory variables 183
3.4.2.4 Statistical analysis 187
3.4.3 Interpretation of the results 187
3.4.3.1 Physical health 187
3.4.3.2 Mental health 194
3.4.3.3 Neck pain 195
3.4.3.4 Back pain 199
3.4.3.5 Patient satisfaction 201

3.4.3.6 Post-traumatic stress disorder 202
3.4.4 Generalisability 213
3.4.5 Implications of the results 215
3.4.6 Significance to future research 215
3.4.7 Significance of work 217
3.5 Conclusion 218

Chapter Four: The association between compensation and outcome after motor vehicle injuries, a prospective study (Motor Vehicle Accident Outcome Study).

4.1 Introduction 219
4.1.1 Study hypotheses 221
4.2 Materials and methods 224
4.2.1 Study population 224
4.2.2 Study location 225
4.2.3 Ethics approval 225
4.2.4 Patient recruitment 226
4.2.5 Piloting of the questionnaire 228
4.2.5.1 Methods 228
4.2.5.2 Results 230
4.2.5.3 Summary 236
4.2.6 Measures 236
4.2.7 Sample size calculation 240
4.2.8 Statistical methods 240
4.3 Results 243
4.3.1 Patient sample 243
4.3.2 Hypothesis 1: Physical health 247
4.3.3 Hypothesis 2: Mental health 249
4.3.4 Hypothesis 3: Neck pain 251
4.3.5 Hypothesis 4: Back pain 255
4.3.6 Hypothesis 5: Patient-rated satisfaction and recovery 257
4.3.7 Hypothesis 6: Surgeon-rated satisfaction and recovery 263
4.3.8 Hypothesis 7: Fracture-related complications 267

4.4 Discussion 270
4.4.1 Summary of main results 270
4.4.2 Comments on methods 271
4.4.2.1 Study population 271
4.4.2.2 Explanatory variables 274
4.4.2.3 Outcome variables 276
4.4.2.4 Statistical analysis 277
4.4.3 Interpretation of the results 278
4.4.3.1 Physical health 278
4.4.3.2 Mental health 279
4.4.3.3 Neck pain 280
4.4.3.4 Back pain 283
4.4.3.5 Patient-rated satisfaction and recovery 284
4.4.3.6 Surgeon-rated satisfaction and recovery 286
4.4.3.7 Fracture-related complications 286
4.4.4 Generalisability 287
4.4.5 Implications of the results 288
4.4.6 Significance to future research 290
4.4.7 Significance of work 291
4.5 Conclusion 293

Chapter Five: Summary

5.1 A comparison of the three main studies 294
5.2 Summary 300
5.3 Conclusion 302

References 304

Appendices 368
Appendix 1: References for articles included in the meta-analysis in Chapter Two 368
Appendix 2: Coding of explanatory and outcome variables in the MTOS 381

Appendix 3: Final model for the multivariate analysis using PTSD as a dichotomous outcome in the MTOS 383
Appendix 4: Significance of claim eligibility when substituted for claim pursuit in the multivariate analysis of the MTOS 384
Appendix 5: Associations between the compensation-related variables in Chapters 3 and 4 386
Appendix 6: Table 3.22 388